

# Exploring options for Sustainable Intensification in Africa RISING

Carl Timler *et al.*

International Conference on Integrated Systems Research  
Ibadan, Nigeria 3<sup>rd</sup> to 6<sup>th</sup> March 2015



# Outline

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# Introduction

- Sustainable Intensification (SI) is key for improved food security, improved livelihoods and healthy environments in Africa.
- Africa RISING – Research In Sustainable Intensification for the Next Generation
- Farming systems analysis using the DEED cycle incorporated in the model Farm DESIGN is a useful tool for identifying
  - trade-offs & synergies between productivity & environmental outcomes,
  - suitable entry points to SI and
  - targeted innovations at farm level



# Methodology

## ■ Rapid Characterization

- Mw: 80 Hh's
- Zm: 800 Hh's

## ■ Functional Typology

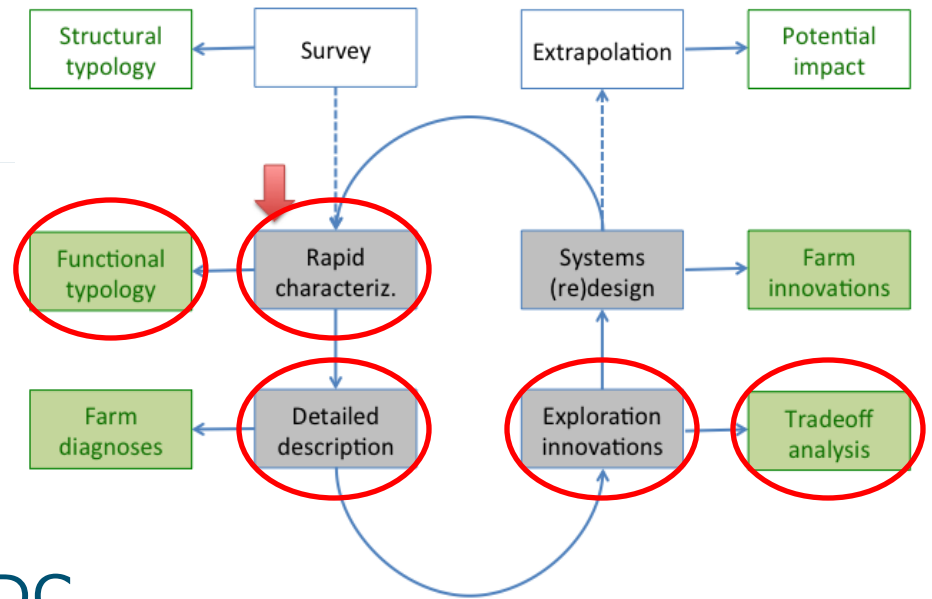
- Selection of Hh's for DC

## ■ Detailed Characterization

- Mw: 12 Hh's surveyed with semi-structured interview
- Zm: 15 Hh's surveyed with structured survey

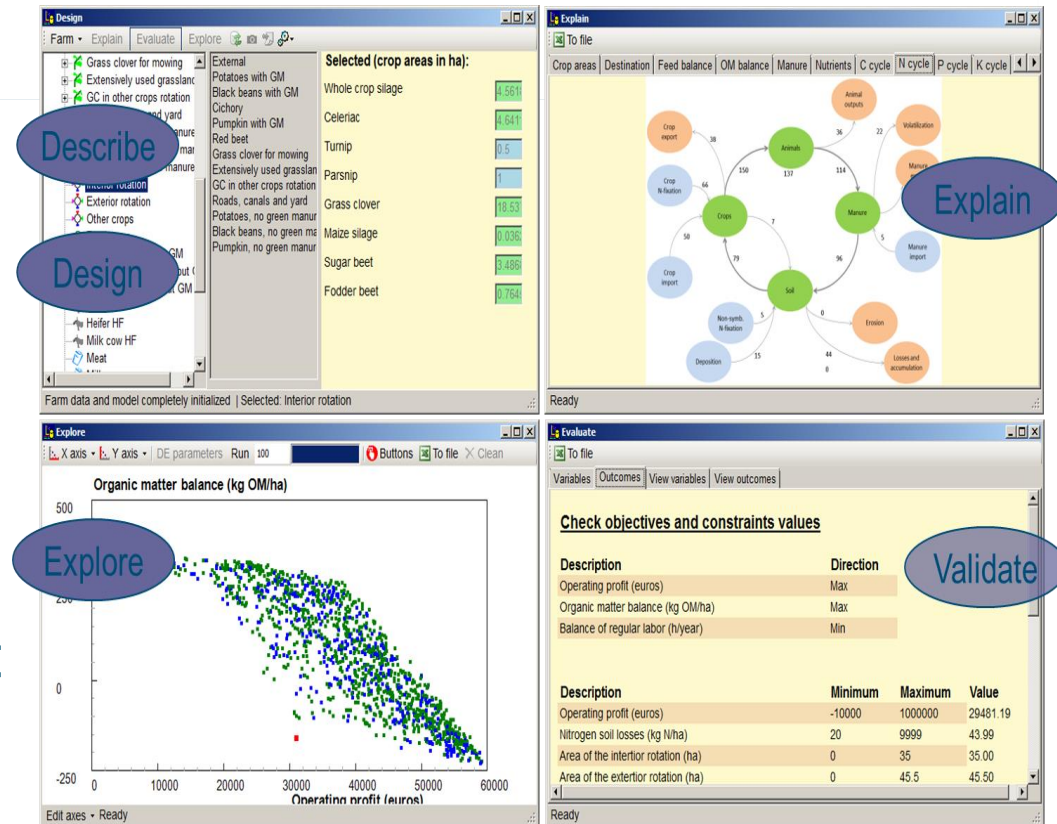
## ■ Exploration using Farm DESIGN

- Analyse Trade-offs and Synergies
- Evaluate Entry Points.



# Farm DESIGN

- Bio-economic, static modelling tool
- Assesses structural as well as functional farm characteristics.
- Info on labour, climate, soil, crops, livestock, inputs, imports, nutrient cycling and assets are inserted in model.
- By creating decision variables, setting constraints and desired outcomes, the interplay of farm components can be illustrated and manipulated, in order to explore and evaluate options for the redesign of the whole farming system.





# Constraints & Critical Points

- Low farm productivity, on-farm income generation and returns to labour
- Limited representation by women in farm decision making
- Low crop yields -> food availability is insufficient during parts of the year
- Limited or untimely availability of resources like seeds and fertilizers
- Lack of improved cultivars and breeds that are more productive or better adapted
- Problems with pest and weed control, in particular Striga is an important issue
- Poor management of crop residues and animal manures -> Large losses of OM and nutrients -> limited availability of these organic resources for soil improvement
- Sub-optimal feeding of livestock -> Low productivity levels of all types of animals kept on the farms
- Limited access to training and advice especially for women
- Challenges due to climate change

# Entry Points Identified

- Encourage seed saving and selection
- Improved water management
- Diversifying cropping, Increase the productivity and integration of legumes in rotations and by intercropping and double-up legume cultivation
- Fencing of fields to allow better livestock and crop residue management
- Developing new strategies for pest and weed management, and Striga control
- Improved management of collected organic resources like manure and crop residues
- Strengthening the role of livestock on farms -> improved nutrient cycling, and the production of high-quality and high-value products
- There is a strong need for education and training, and for the development of institutional arrangements and community-based organizations

# Case Study: Exploration with FD in Zambia

- Eastern Province Zambia; Chipata, Katete, Lundazi districts
- Baseline survey used to create typology with 5 types
  - Cultivated area (ha)
  - Tropical Livestock Units (TLU)
  - Total labor inputs (days/year)
  - Off-farm income (\$)
  - Costs for hired labor (\$)
  - Proportions of labor used for land preparation and weeding
  - Proportion of area used for legume cultivation
  - Legume experience (years)
  - Legume score

Type	Description
1	Low Resource Endowed, Most Labour for Land Preparation, Legume Growers, Most Food Insecure
2	Low Resource Endowed, Most Labour for Weeding, Few Legumes Grown
3	Medium Resource Endowed, Legume Growers, Highest Relative Animal Income
4	Medium to High Resource Endowed, Highest Off-farm Income
5	High Resource Endowed, High Crop and Animal Income



# Detailed Description Zambia

	Type 1	Type 2	Type 3	Type 4	Type 5
Farm area (ha)	3.2	2.0	6.7	13.4	23
Crops currently grown	Maize Groundnut Cowpeas Tobacco Pumpkin	Maize Groundnut Sunflower Cotton Sw. Potato Sugarcane Pumpkin Vegetables	Maize Groundnut Sunflower Soybean Sw. Potato Cassava	Maize Groundnut Sunflower Pumpkin Cowpea Pumpkin Vegetables	Maize Groundnut Sunflower Cotton Vegetables

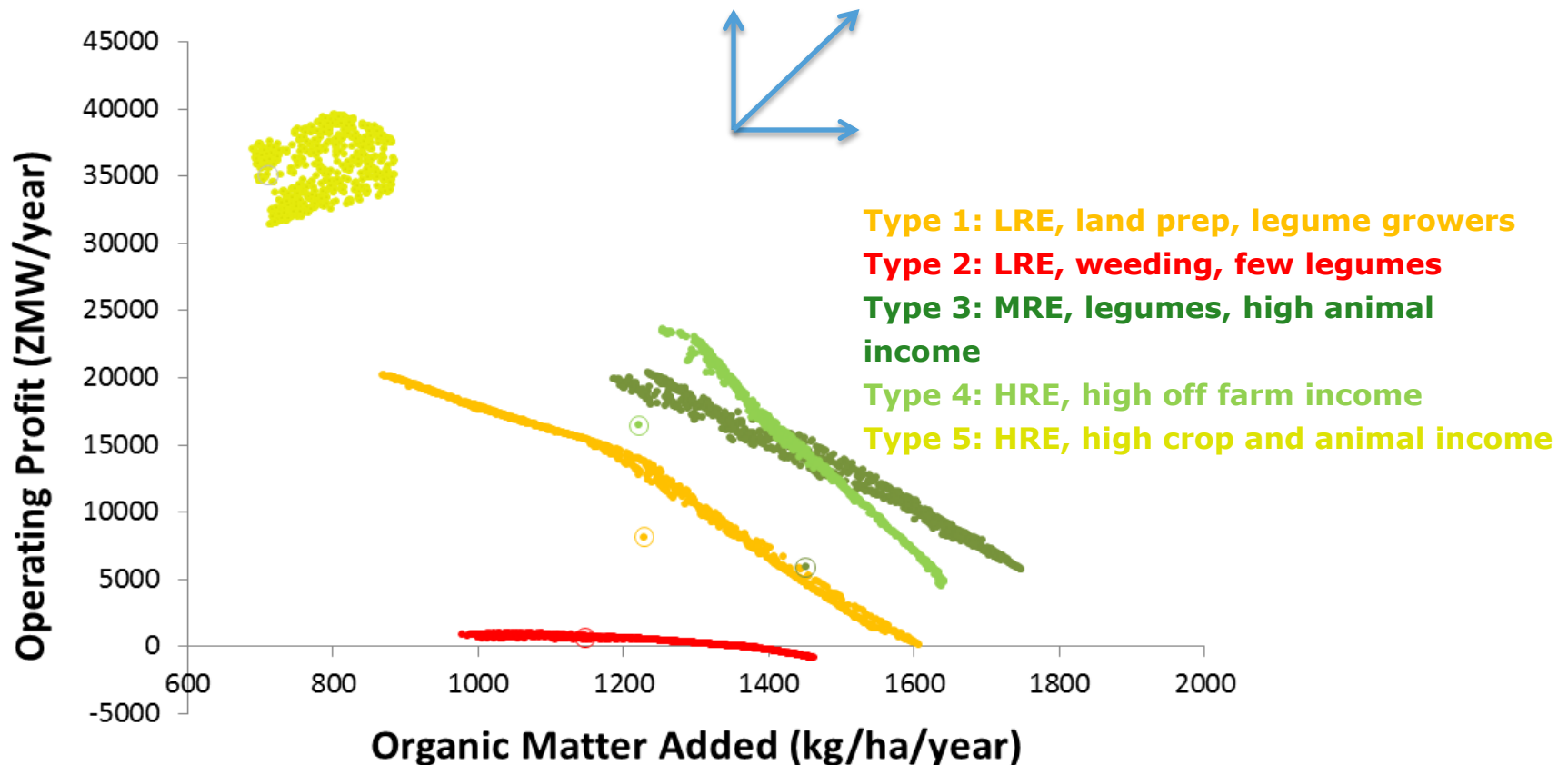
# Detailed Description Zambia

	Type 1	Type 2	Type 3	Type 4	Type 5
Animals currently owned	Pigs Chickens	Cattle Pigs	Cattle Goats Chickens	Cattle Goats Sheep Pigs Ducks Chickens	Cattle Goats Pigs Chickens Doves
Operating profit (ZMW/year)	8 134	635	5 880	16 432	35 080
Organic matter added (kg/ha/year)	1 229	1 147	1451	1 222	710
Hired labor (hours/year)	0	50	3 027	5 503	360

# Exploration options: Zambia

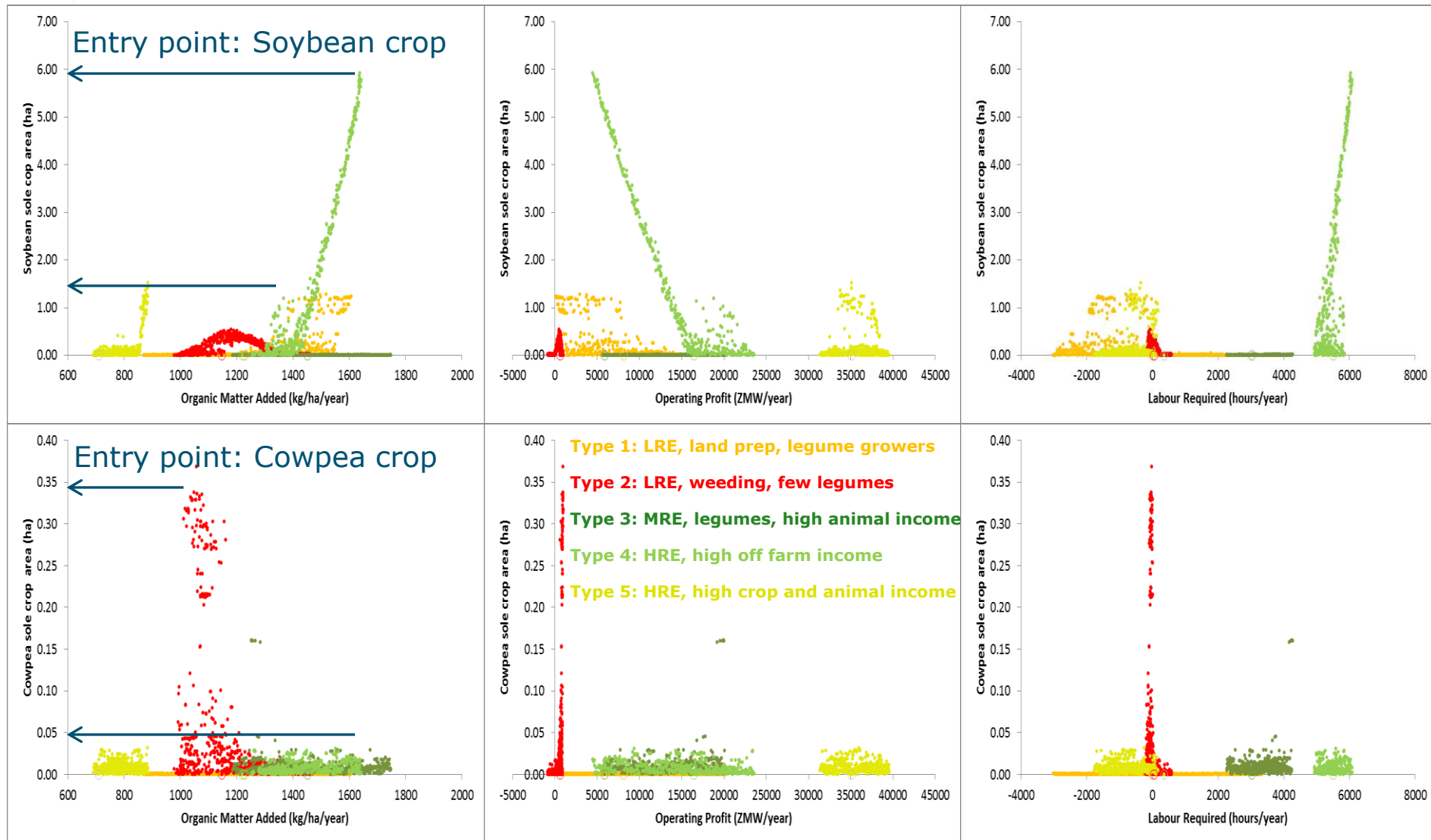
- A range of new crops and animal types that could be included, and new ways to cultivate/manage these.
- Zambia (specific for SIMLEZA focus):
  - Intercrop of maize and cowpea
  - Growing maize after soybean or cowpea or sole crops of soybean or cowpea
  - Using crop residues as soil amendment (mulch)

# Results: Exploration of Trade-offs Zambia



Performance of alternative farm configurations in terms of two objectives Organic Matter added and Operating Profit, for five farm types in eastern Zambia (type-1: orange, type-2: red, type-3: dark green, type-4: light green, type-5: yellow). The points with a circle indicate the performance of the original farm configurations.

# Exploration of entry points per farm type



# Conclusions

- Farm DESIGN is a useful tool in evaluating trade-offs and synergies between farm objectives.
- The model-based exploration generates new insights into the possible trajectories that farmers could take towards sustainable intensification.
- Potential points in the alternative configurations between the end objective and the current situation could map out a set of land use changes and animal number dynamics that could be seen as stepping stones towards sustainable intensification.
- Improved targeting and matching of entry points to farm types can hopefully improve adoption of promising technologies.



Thank You for your attention

Questions?

